

**Notice of Allowability**

Application No.

10/661,739

Applicant(s)

LAIRD ET AL.

Examiner

Kandasamy Thangavelu

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-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address--

All claims being allowable, PROSECUTION ON THE MERITS IS (OR REMAINS) CLOSED in this application. If not included herewith (or previously mailed), a Notice of Allowance (PTOL-85) or other appropriate communication will be mailed in due course. **THIS NOTICE OF ALLOWABILITY IS NOT A GRANT OF PATENT RIGHTS.** This application is subject to withdrawal from issue at the initiative of the Office or upon petition by the applicant. See 37 CFR 1.313 and MPEP 1308.

1. ☒ This communication is responsive to 2 November 2004.
2. ☒ The allowed claim(s) is/are 1-84.
3. ☒ The drawings filed on 12 September 2003 are accepted by the Examiner.
4. ☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).
  - a) ☐ All b) ☐ Some\* c) ☐ None of the:
  1. ☐ Certified copies of the priority documents have been received.
  2. ☐ Certified copies of the priority documents have been received in Application No. \_\_\_\_\_.
  3. ☐ Copies of the certified copies of the priority documents have been received in this national stage application from the International Bureau (PCT Rule 17.2(a)).

\* Certified copies not received: \_\_\_\_\_.

Applicant has THREE MONTHS FROM THE "MAILING DATE" of this communication to file a reply complying with the requirements noted below. Failure to timely comply will result in ABANDONMENT of this application.

**THIS THREE-MONTH PERIOD IS NOT EXTENDABLE.**

5. ☐ A SUBSTITUTE OATH OR DECLARATION must be submitted. Note the attached EXAMINER'S AMENDMENT or NOTICE OF INFORMAL PATENT APPLICATION (PTO-152) which gives reason(s) why the oath or declaration is deficient.
  6. ☐ CORRECTED DRAWINGS (as "replacement sheets") must be submitted.
    - (a) ☐ including changes required by the Notice of Draftsperson's Patent Drawing Review (PTO-948) attached
      - 1) ☐ hereto or 2) ☐ to Paper No./Mail Date \_\_\_\_\_.
    - (b) ☐ including changes required by the attached Examiner's Amendment / Comment or in the Office action of Paper No./Mail Date \_\_\_\_\_.
- Identifying indicia such as the application number (see 37 CFR 1.84(c)) should be written on the drawings in the front (not the back) of each sheet. Replacement sheet(s) should be labeled as such in the header according to 37 CFR 1.121(d).
7. ☐ DEPOSIT OF and/or INFORMATION about the deposit of BIOLOGICAL MATERIAL must be submitted. Note the attached Examiner's comment regarding REQUIREMENT FOR THE DEPOSIT OF BIOLOGICAL MATERIAL.

**Attachment(s)**

1. ☐ Notice of References Cited (PTO-892)
2. ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)
3. ☐ Information Disclosure Statements (PTO-1449 or PTO/SB/08), Paper No./Mail Date \_\_\_\_\_
4. ☐ Examiner's Comment Regarding Requirement for Deposit of Biological Material
5. ☐ Notice of Informal Patent Application (PTO-152)
6. ☐ Interview Summary (PTO-413), Paper No./Mail Date \_\_\_\_\_
7. ☒ Examiner's Amendment/Comment
8. ☒ Examiner's Statement of Reasons for Allowance
9. ☐ Other \_\_\_\_\_

KEVIN J. TESKA  
SUPERVISORY  
PATENT EXAMINER

## **DETAILED ACTION**

### ***Introduction***

1. This communication is in response to the Applicants' communication dated November 2, 2004. Claims 1-84 of the application are pending.

### ***Drawings***

2. The drawings filed on September 12, 2003 are accepted.

### ***Examiner's Amendment***

3. Authorization for this examiner's amendment was given in a telephone interview with Mr. Victor Lebovici on March 23, 2005.

An examiner's amendment to the record appears below. Should the changes and/or additions be unacceptable to applicant, an amendment may be filed as provided by 37 CFR 1.312. To ensure consideration of such an amendment, it MUST be submitted no later than the payment of the issue fee.

4. In the Claims:

In Claim 1, Lines 16-20, "compare said position of said vehicle to said virtual violation line, and generate an indication of a violation in the event said processing unit

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determines that said position of said vehicle is beyond said location and that said vehicle has traveled into said intersection during said red light phase of said traffic signal”

has been changed to

--compare said position of said vehicle to said virtual violation line, and generate an indication of a violation in the event said processing unit determines that said position of said vehicle is beyond said virtual violation line and that said vehicle has traveled into said intersection during said red light phase of said traffic signal--.

In Claim 29, Lines 7-9, “a plurality of showing at least one vehicle approaching said first traffic signal, said images derived from an output of said violation image capturing device”

has been changed to

-- a plurality of images showing at least one vehicle approaching said first traffic signal, said images derived from an output of said violation image capturing device --.

### ***Reasons for Allowance***

5. Claims 1-84 of the application are allowed over prior art of record.

6. The following is an Examiner's statement of reasons for the indication of allowable subject matter:

The closest prior art of record shows:

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(1) a device for detecting traffic violation includes a television camera for taking an image of the road; a vehicle movement measuring instrument for processing the image data from the television camera and for measuring the position and speed of a vehicle; a signal state detector for detecting an indication of the color of the signal lights; and a traffic signal violating vehicle detector for detecting a vehicle that has violated the traffic signal based on the position and speed of the vehicle measured and the color of the signal lights detected; the vehicle movement measuring instrument measures the distance from the intersection; if a vehicle is within the intersection, when the signal has red indication of the signal lights, the vehicle is detected to have violated the traffic signal (**Toyama**, U.S. Patent 5,432,547);

(2) A traffic monitoring device comprising a sensor responding to passing vehicles, a means for determining the traffic violation by a passing vehicle and a means for recording such vehicle; an induction loop is imbedded in the road joining the intersection; the device for monitoring the intersection comprises a signal processing unit and a photographic camera controlled by the signal processing unit; the signal processing unit receives a sensor signal from the sensor and a stop phase signal from the traffic light; when the sensor signal appears during the stop phase, the camera is released and it takes a picture of the intersection with the traffic light showing the stop phase and of the vehicle when traffic violation is determined; the traffic violation is evaluated using electronic data processing; formal recording of the violation is done by means of electronic data processing (**Loeven**, U.S. Patent 5,041,828); and

(3) a device for triggering a camera to photograph a vehicle within a traffic intersection, where the triggering of the camera is dependent on the speed of the vehicle

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and the presence of the vehicle; the device includes a sensor system to transmit a signal corresponding to a moving vehicle and a control system for processing the signals and triggering the camera; the vehicle is photographed in a predetermined zone within the intersection regardless of the speed of the vehicle (Mee, U.S. Patent 6,111,523).

6.1 Applicants' first set of claims consists of Claims 1-14.

Independent Claim 1 is directed to a system for detecting a violation of a traffic signal at an intersection. The claim identifies the uniquely distinct features of:

“a virtual violation line interface for receiving from a user data defining a virtual violation line that corresponds to a location at said intersection that if crossed by a vehicle entering said intersection during a red light phase of said traffic signal, is indicative of a violation of said traffic signal by said vehicle” and

“a processing unit operative to: analyze said at least one image to identify a position of said vehicle with respect to said virtual violation line, compare said position of said vehicle to said virtual violation line, and generate an indication of a violation in the event said processing unit determines that said position of said vehicle is beyond said virtual violation line and that said vehicle has traveled into said intersection during said red light phase of said traffic signal”.

Because the closest prior art fails to teach or fairly suggest a virtual violation line interface for receiving from a user data defining a virtual violation line that corresponds to a location at said intersection that if crossed by a vehicle entering said intersection during a red light phase of said traffic signal, is indicative of a violation of said traffic

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signal by said vehicle; and a processing unit operative to analyze said at least one image to identify a position of said vehicle with respect to said virtual violation line, compare said position of said vehicle to said virtual violation line, and generate an indication of a violation in the event said processing unit determines that said position of said vehicle is beyond said virtual violation line and that said vehicle has traveled into said intersection during said red light phase of said traffic signal, as claimed by the Applicants, Claims 1-14 are deemed novel and allowable.

6.2 Applicants' second set of claims consists of Claims 15-28.

Independent Claim 15 is directed to a method for detecting a violation of a traffic signal. The claim identifies the uniquely distinct features of:

“storing in a storage device a representation of a traffic intersection, said representation of said intersection including a virtual violation line corresponding to a location at said intersection that if crossed by a vehicle entering said intersection during a red light phase of said traffic signal, is indicative of a violation of said traffic signal by said vehicle, said location of said virtual violation line with respect to said intersection being user configurable” and “generating an output indicative of a violation of a red light phase of said traffic signal in the event said analyzing step indicates that said vehicle has traveled beyond said location corresponding to said virtual violation line and into said intersection during said red light phase of said traffic signal”.

Because the closest prior art fails to teach or fairly suggest storing in a storage device a representation of a traffic intersection, said representation of said intersection

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including a virtual violation line corresponding to a location at said intersection that if crossed by a vehicle entering said intersection during a red light phase of said traffic signal, is indicative of a violation of said traffic signal by said vehicle, said location of said virtual violation line with respect to said intersection being user configurable; and generating an output indicative of a violation of a red light phase of said traffic signal in the event said analyzing step indicates that said vehicle has traveled beyond said location corresponding to said virtual violation line and into said intersection during said red light phase of said traffic signal, as claimed by the Applicants, Claims 15-28 are deemed novel and allowable.

6.3 Applicants' third set of claims consists of Claims 29-43.

Independent Claim 29 is directed to a collision avoidance system for a first traffic signal having a current light phase equal to one of the set consisting of at least red and green. The claim identifies the uniquely distinct features of:

“a processing unit responsive to said plurality of images and an indication of said current first traffic signal light phase, for generating at least one violation prediction for said at least one vehicle approaching said first traffic signal, said violation prediction indicating a likelihood that said at least one vehicle approaching said first traffic signal will violate an upcoming red light phase of said first traffic signal”, “a collision avoidance unit responsive to said violation prediction, for asserting at least one violation predicted signal” and “a traffic light controller for said second traffic signal for controlling said second traffic signal responsive to said violation predicted signal in order to signal traffic approaching said second traffic signal not to enter said intersection”.



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Because the closest prior art fails to teach or fairly suggest a processing unit responsive to said plurality of images and an indication of said current first traffic signal light phase, for generating at least one violation prediction for said at least one vehicle approaching said first traffic signal, said violation prediction indicating a likelihood that said at least one vehicle approaching said first traffic signal will violate an upcoming red light phase of said first traffic signal; a collision avoidance unit responsive to said violation prediction, for asserting at least one violation predicted signal; and a traffic light controller for said second traffic signal for controlling said second traffic signal responsive to said violation predicted signal in order to signal traffic approaching said second traffic signal not to enter said intersection, as claimed by the Applicants, Claims 29-43 are deemed novel and allowable.

6.4 Applicants' fourth set of claims consists of Claims 44-54.

Independent Claim 44 is directed to a method of collision avoidance at an intersection for a first traffic signal having a current light phase equal to one of the set consisting of at least red and green. The claim identifies the uniquely distinct features of:

“maintaining at least one virtual violation line at an intersection for said at least one vehicle approaching said first traffic signal”, “generating, responsive to said plurality of images and an indication of said current first traffic signal light phase, at least one violation prediction for said at least one vehicle approaching said first traffic signal, said violation prediction indicating a likelihood that said at least one vehicle approaching said first traffic signal will violate an upcoming red light phase of said first traffic signal”,



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“asserting, responsive to said violation prediction, at least one violation predicted signal coupled to said second traffic signal” and “controlling, responsive to said violation predicted signal, said second traffic signal in order to signal traffic approaching said second traffic signal not to enter said intersection”.

Because the closest prior art fails to teach or fairly suggest maintaining at least one virtual violation line at an intersection for said at least one vehicle approaching said first traffic signal; generating, responsive to said plurality of images and an indication of said current first traffic signal light phase, at least one violation prediction for said at least one vehicle approaching said first traffic signal, said violation prediction indicating a likelihood that said at least one vehicle approaching said first traffic signal will violate an upcoming red light phase of said first traffic signal; asserting, responsive to said violation prediction, at least one violation predicted signal coupled to said second traffic signal; and controlling, responsive to said violation predicted signal, said second traffic signal in order to signal traffic approaching said second traffic signal not to enter said intersection, as claimed by the Applicants, Claims 44-54 are deemed novel and allowable.

6.5 Applicants' fifth set of claims consists of Claims 55-69.

Independent Claim 55 is directed to a method of avoiding collisions at an intersection. The claim identifies the uniquely distinct features of:

“receiving data defining a virtual violation line from a user, the virtual violation line corresponding to a location at said intersection” and “analyzing said images to determine whether said vehicle is likely, during an upcoming red light phase of said

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traffic signal, to cross said virtual violation line”, and “upon determining that said vehicle is likely to cross said virtual violation line during said upcoming red light phase of said traffic signal, generating a signal operative to control an indicator to warn cross traffic approaching said intersection not to enter said intersection”.

Because the closest prior art fails to teach or fairly suggest receiving data defining a virtual violation line from a user, the virtual violation line corresponding to a location at said intersection; analyzing said images to determine whether said vehicle is likely, during an upcoming red light phase of said traffic signal, to cross said virtual violation line; and upon determining that said vehicle is likely to cross said virtual violation line during said upcoming red light phase of said traffic signal, generating a signal operative to control an indicator to warn cross traffic approaching said intersection not to enter said intersection, as claimed by the Applicants, Claims 55-69 are deemed novel and allowable.

6.6 Applicants' sixth set of claims consists of Claims 70-84.

Independent Claim 70 is directed to a system for avoiding collisions at an intersection. The claim identifies the uniquely distinct features of:

“a virtual violation line interface for receiving data defining a virtual violation line from a user, the virtual violation line corresponding to a location at said intersection”  
and “a processing unit operative: (1) to analyze said images to determine whether said vehicle is likely, during an upcoming red light phase of said traffic signal, to cross said virtual violation line, and (2) upon determining that said vehicle is likely to cross said

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virtual violation line during said upcoming red light phase of said traffic signal, to generate a signal operative to control an indicator to warn cross traffic approaching said intersection not to enter said intersection”.

Because the closest prior art fails to teach or fairly suggest a virtual violation line interface for receiving data defining a virtual violation line from a user, the virtual violation line corresponding to a location at said intersection and a processing unit operative: (1) to analyze said images to determine whether said vehicle is likely, during an upcoming red light phase of said traffic signal, to cross said virtual violation line, and (2) upon determining that said vehicle is likely to cross said virtual violation line during said upcoming red light phase of said traffic signal, to generate a signal operative to control an indicator to warn cross traffic approaching said intersection not to enter said intersection, as claimed by the Applicants, Claims 70-84 are deemed novel and allowable.

7. Any comments considered necessary by applicant must be submitted no later than the payment of the issue fee and, to avoid processing delays, should preferably accompany the issue fee. Such submissions should be clearly labeled "Comments on Statement of Reasons for Allowance.”

8. Any inquiry concerning this communication or earlier communications from the examiner should be directed to Dr. Kandasamy Thangavelu whose telephone


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number is 571-272-3717. The examiner can normally be reached on Monday through Friday from 8:00 AM to 5:30 PM.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Kevin Teska, can be reached on 571-272-3716. The fax phone number for the organization where this application or proceeding is assigned is 703-872-9306.

Any inquiry of a general nature or relating to the status of this application or proceeding should be directed to TC 2100 Group receptionist: 571-272-2100.

K. Thangavelu  
Art Unit 2123  
March 23, 2005



KEVIN J. TESKA  
SUPERVISORY  
PATENT EXAMINER